CLAIMS

1. A communication method between a collecting unit (5) and a plurality of control devices (7i), each of which is associated with at least an electrical device (1i), via a communication channel,

wherein messages are exchanged between said collecting unit (5) and said control devices (7i), each of which contains at least:

- a progressive message number (Pr_N);
- an addressee identification number (ID_addressee);
- a portion of informative content and/or executable commands (M4);

wherein a specific identification number (ID_i; Ser_Ni), is assigned to each control device, said messages being addressable selectively to a specific control device via said addressee identification number;

and wherein when a control device (7i) receives a message containing an addressee identification number (ID_addressee) differing from its own identification number (ID_i; Ser_Ni), after a given delay interval said control device generates and transmits on said channel (3) at least one echo of said message, unless a reply to said message from the control device, to which said message was addressed, was received,

a routine being activated to prevent unlimited generations of echoes of a given message.

2. Method as claimed in claim 1, wherein the control device (7i) that generated an echo of the message received and addressed to a different control device, temporarily stores identifying information of said message and does not generate subsequent echoes of said message while the identifying information remains stored.

3. Method as claimed in claim 2, wherein each control device stores the identifying information of messages of which it has generated an echo in a temporary list containing identifying information of a predetermined maximum number of messages.

4. Method as claimed in one or more of the previous claims, wherein each control device is programmed to generate said echo with a pre-set delay, said delay being longer than the time required by the control device to which the message is addressed to generate a reply to said message.

5. Method as claimed in one or more of the previous claims, wherein said collecting unit (5) is programmed such that each time it generates a message addressed to a specific control device (7i), it switches in a waiting condition and waits a reply to said message.

6. Method as claimed in claim 5, wherein if said collecting unit does not receive said reply within a pre-set time interval (TCmax), said collecting unit (5) switches from said waiting condition to an operative condition and generates a message addressed to a different control device (7i).

7. Method according to claim 6, wherein if said collecting unit (5) does not receive a reply to a maximum number (NOmax) of subsequent messages addressed to said control device (7i) , said collecting unit (5) generates an alarm message and sets said control device as non-operating.

8. Method according to claim 7, wherein said maximum number (NOmax) is greater than 1.

9. Method according to claim 6, 7 or 8, wherein said pre-set time interval (TCmax) is variable and can be differently set for each control device.

10. Method according to claim 9, wherein for a given control device said pre-set time interval (TCmax) is shortened if said control device replies to a message in a time shorter than said time interval and said pre-set time interval is increased if the reply from said control device is not received with the pre-set time interval.

11. Method according to one or more of the previous claims, wherein said portion of informative content and/or executable commands (M4) of said message includes

data indicating whether the message is generated by said collecting unit (5) or by a control device (7i).

12. Method as claimed in one or more of the previous claims, wherein said message contains a counter (TTL).

13. Method as claimed in claim 12, wherein when a control device (7i) receives a message containing an addressee identification number (ID_addressee) differing from its own identification number (ID_i), it transmits an echo of the message received on said channel (3), decreasing said counter (TTL) by a predetermined value.

14. Method as claimed in claim 12 or 13, wherein broadcast messages are sent from said collecting unit, addressed to all the control devices (7i) connected to said channel, and wherein said broadcast messages are identified by a progressive number (Pr_B) differing from the progressive numbers distinguishing the messages addressed to the individual control devices and contain a counter (TTL).

15. Method as claimed in claim 14, wherein when a control device receives a broadcast message it transmits an echo of the broadcast message on said channel (3), decreasing said counter (TTL) by a predetermined value.

16. Method as claimed in claim 13 or 15, wherein before transmitting the echo of said message on said channel (3), the control device checks the value contained in

said counter (TTL) and transmits the echo of the message on the channel only if the value of the counter of the message received is above a minimum pre-established value.

17. Method as claimed in one or more of the previous claims, wherein each control device (7i) transmits said echo of the message received with its own specific delay (□T).

18. Method as claimed in claim 17, wherein the delay with which each control device transmits the echo of the message received is determined as a function of the identification number (ID_i) assigned to said control device (7i).

19. Method as claimed in claim 18, wherein said delay is equal to the duration of the message (Tm) multiplied by the identification number (ID_i) of the respective control device (7i) that transmits the echo.

20. Method as claimed in one or more of the previous claims, wherein when a control device (7i) receives a message containing its own identification number (ID_i) as the addressee identification number (ID_addressee), it transmits a reply message on said channel (3) in which:

- the progressive number (Pr_N) is the same as the progressive number of the message received (Pr_N) increased by a predetermined value;

- and the portion of informative content and/or of command (M4) contains a reply to the message received.

21. Method according to claim 20, wherein in the reply message:

- the sender identification number (ID_sender) corresponds to the addressee identification number (ID_addressee) of the message received;

- the addressee identification number (ID_addressee) corresponds to the sender identification number (ID_sender) of the message received.

22. Method as claimed in claim 20 or 21, wherein said progressive number in the reply message is the same as the progressive number of the message received increased by one unit.

23. Method as claimed in one or more of the previous claims, wherein transmission of an echo of a first message by a control device (7i) is inhibited when said control device receives a second message containing a progressive number the same as the progressive number (Pr_N) of the first message increased by one unit.

24. Method as claimed in claim 12, wherein the initial value of said counter (TTL) is set equal to the total number (n) of control devices (7i) connected to said channel (3).

25. Method as claimed in one or more of the previous claims, comprising an initial accrediting phase of the control devices (7i) by the collecting unit (5), during

which said collecting unit assigns a specific identification number (ID_i) to each control device (7i).

26. Method as claimed in claim 25, wherein:

- said collecting unit knows the total number (n) of control devices (7i) connected to said channel;

- during said accrediting phase the collecting unit (5) repeatedly transmits an accrediting request on said channel;

- each control device (7i), to which an identification number (ID_i) has not yet been assigned by said collecting unit, transmits, with a delay (□T), a reply to the accrediting request, the reply containing a serial number (Ser_N) univocally correlated to said control device;

- said collecting unit processes only the first of the replies received, combining a univocal identification number (ID_i) with the respective serial number (Ser_N) contained in it and sending said identification number to the control device to which said serial number corresponds, via a message addressed to said control device;

- and the control device that receives said identification number stores it and stops replying to any subsequent accrediting requests emitted by the collecting unit.

27. Method as claimed in claim 26, wherein during said accrediting phase when each control device (7i), to which an identification number has not yet been assigned

receives an accrediting request, it generates a random number (N_RND) and transmits said reply with a delay which is a function of said random number.

28. Method as claimed in claim 27, wherein said delay is equal to the temporal duration of the message containing the request, multiplied by said random number.

29. Method as claimed in claim 25, 26, 27 or 28, wherein each control device to which a specific identification number has already been assigned transmits at least an echo of each of the subsequent accrediting requests on said channel.

30. Method as claimed in claim 29, wherein each control device to which a specific identification number has already been assigned transmits at least one echo of each of the subsequent replies on said channel.

31. Method as claimed in one or more of the claims from 26 to 30, wherein said accrediting requests and said replies contain at least:

- a progressive number (Pr_N);
- a field with a command (M4) to request a reply.

32. Method as claimed in one or more of the previous claims, wherein said collecting unit (5) and said control devices (7i) are connected to each other via a power supply line (3) of said electrical devices (1i), which constitutes said transmission channel, and along which information is exchanged between the collecting unit and the control devices via power line carrier transmission.

33. A system comprising a collecting unit (5) including at least a processor (15), a memory (17) and a transmission and reception device (13), and a plurality of control devices (7i), each of which comprises at least a processor (9), a memory (11) and a transmission and reception device (12) and is interfaced with at least an electrical device (1i), said collecting unit (5) and said control devices (7i) being connected to one another via a communication channel,

wherein the collecting unit (5) and the control devices (7i) are programmed to exchange messages between said collecting unit and said control devices, each of which contains at least:

- a progressive message number (Pr_N);
- an addressee identification number (ID_addressee);
- a portion of information content and/or executable commands (M4);

wherein each control device is assigned its own identification number (ID_I; Ser_Ni), said messages being addressable selectively to a specific control device via said addressee identification number;

and wherein when a control device (7i) receives a message containing an addressee identification number (ID_addressee) differing from its own identification number (ID_i; Ser_Ni), after a given delay interval said control device generates and transmits on said channel (3) at least one echo of said message, unless a reply

to said message from the control device, to which said message was addressed, has already been received

a routine being provided to prevent unlimited generations of echoes of a given message.

34. System as claimed in claim 33, wherein the control device (7i) that generated an echo of the message received and addressed to a different control device is programmed to temporarily store identifying information of said message and does not generate subsequent echoes of said message while the identifying information remains stored.

35. System as claimed in claim 34, wherein each control device comprises a memory, and is programmed to store the identifying information of messages it has generated an echo of in a temporary list containing identifying information of a predetermined maximum number of messages.

36. System as claimed in one or more of claims 33 to 35, wherein each control device is programmed to generate said echo with a pre-set delay, said delay being longer than the time required by the control device to which the message is addressed to generate a reply to said message.

37. System as claimed in one or more of claims 33 to 36, wherein said collecting unit (5) is programmed such that each time it generates a message addressed to a

specific control device (7i), it switches in a waiting condition and waits a reply to said message.

38. System as claimed in claim 42, wherein said collecting unit is programmed such that if said collecting unit does not receive said reply within a pre-set time interval (TCmax), said collecting unit (5) switches from said waiting condition to an operative condition and generates a message addressed to a different control device.

39. System according to claim 38, wherein said collecting unit is programmed such that if said collecting unit (5) does not receive a reply to a maximum number (NOmax) of subsequent messages addressed to said control device (7i) , said collecting unit (5) generates an alarm message and sets said control device as non-operating.

40. System according to claim 39, wherein said maximum number (NOmax) is greater than 1

41. System according to claim 38, 39 or 40, wherein said pre-set time interval (TCmax) is variable and can be differently set for each control device

42. System according to claim 41, wherein said collecting unit is programmed such that for a given control device said pre-set time interval (TCmax) is shortened if said control device replies to a message in a time shorter than said time interval

and said pre-set time interval is increased if the reply from said control device is not received with the pre-set time interval

43. System according to one or more of claims 33 to 42, wherein said portion of informative content and/or executable commands (M4) of said message includes data indicating whether the message is generated by said collecting unit (5) or by a control device (7i).

44. System as claimed in one or more of the claims from 33 to 43, wherein said messages contain a counter (TTL).

45. System as claimed in claim 44, wherein the control devices are programmed so that when a control device receives a message containing an addressee identification number (ID_addressee) differing from its own identification number (ID_i), it transmits an echo of the message received on said channel (3), decreasing said counter (TTL) by a predetermined value.

46. System as claimed in one or more of the claims from 33 to 44, wherein said collecting unit sends said control devices broadcast messages addressed to all the control devices connected to said channel, and wherein said broadcast messages are identified by a progressive number (Pr_B) differing from the progressive numbers that distinguish the messages addressed to each control device and contain a counter (TTL).

47. System as claimed in claim 46, wherein said control devices are programmed so that when a control device receives a broadcast message it transmits an echo of the broadcast message on said channel (3), decreasing said counter (TTL) by a predetermined value.

48. System as claimed in at least claim 44 or 47, wherein each control device (7i) is programmed so that before transmitting the echo of a message on said channel (3), it checks the value contained in said counter (TTL) and transmits the echo of the message on said channel only if the value of the counter of the message received is above a minimum pre-established value.

49. System as claimed in one or more of the claims 33 to 48, wherein each control device is programmed to transmit an echo of the message received with a specific delay (□T).

50. System as claimed in claim 49, wherein each control device is programmed to transmit said echo with a delay determined as a function of the identification number (ID_i) assigned to said control device.

51. System as claimed in claim 50, wherein said delay is equal to the duration of the message (Tm) multiplied by the identification number (ID_i) of the respective control device.

52. System as claimed in one or more of the claims from 33 to 51, wherein each control device (7i) is programmed so that when it receives a message containing its own identification number (ID_i) as the addressee identification number (ID_addressee) it transmits a reply message on said channel, in which:

- the progressive number (Pr_N) is the same as the progressive number of the message received increased by a predetermined value;
- and the portion of informative content and/or of command (M4) contains a reply to the message received.

53. System according to claim 52, wherein each control device is programmed such that in said reply:

- the sender identification number (ID_sender) corresponds to the addressee identification number (ID_addressee) of the message received;
- the addressee identification number (ID_addressee) corresponds to the sender identification number (ID_sender) of the message received.

54. System as claimed in claim 52 or 53, wherein said progressive number (Pr_N) in the reply message is the same as the progressive number of the message received increased by one unit.

55. System as claimed in one or more of claims 33 to 54, wherein each control device is programmed so that the transmission of an echo of a first message is

inhibited when said control device receives a second message containing a progressive number (Pr_N) the same as the progressive number of the first message increased by one unit.

56. System as claimed in one or more of the claims from 33 to 55, wherein the collecting unit and the control devices are programmed to assign each time as initial value to said counter (TTL) the total number (n) of control devices (7i) connected to said channel (3).

57. System as claimed in one or more of the claims from 33 to 56, wherein said collecting unit and said control devices are programmed to execute an initial accrediting phase of the control devices (7i) by the collecting unit (5), during which said collecting unit assigns the respective identification number (ID_i) to each control device.

58. System as claimed in claim 57, wherein:

- the total number (n) of control devices connected to said channel is stored in said collecting unit;
- the collecting unit (5) is programmed to repeatedly transmit an accrediting request on said channel during said accrediting phase;
- the control devices are programmed so that each control device, which has not yet been assigned with an identification number (ID_i) by said collecting unit,

transmits with a delay, (□T) a reply to the accrediting request on said channel (3), the reply containing a serial number (Ser_N) univocally correlated to said control device;

- said collecting unit is programmed to process only the first of the replies received, combining a univocal identification number (ID_I) with the respective serial number (Ser_N) and sending said identification number to the control device to which said serial number corresponds via a message addressed to it;

- and the control devices are programmed so that the control device that receives said identification number stores it and stops replying to any subsequent accrediting requests emitted by the collecting unit.

59. System as claimed in claim 58, wherein said control devices are programmed so that during said accrediting phase when each control device (7i) that has not yet been assigned an identification number receives an accrediting request it generates a random number (N_RND) and transmits said reply with a delay that is a function of said random number.

60. System as claimed in claim 59, wherein said delay is equal to the temporal duration of the message containing the request, multiplied by said random number.

61. System as claimed in claim 58, 59 or 60, wherein the control devices are programmed so that each control device, which has already been assigned its own

specific identification number (ID_i), transmits at least an echo of each of the subsequent accrediting requests and/or subsequent replies on said channel.

62. System as claimed in claim 58, 59, 60 or 61, wherein said accrediting requests and said replies contain:

- a progressive number (Pr_N);
- a field with a command to request a reply (M4).

63. System as claimed in one or more of the claims from 33 to 62, wherein said communication channel is constituted by a power supply line (3) of said electrical devices, transmission taking place via power line carrier transmission, the transmission and reception devices comprising respective modems.

64. A control device (7i) for electrical devices (1i) comprising at least a processor (9), a memory (11), a connection to a corresponding electrical device (1i), and a device for transmission and reception (12) on a communication channel for the reception and the transmission of information and/or commands, to which an identification number (ID_i) is assigned, said control device being programmed to receive and transmit messages via said communication channel, each of which contains at least:

- a progressive message number (Pr_N);
- an addressee identification number (ID_addressee);

- a portion of informative content and/or executable commands (M4);

and is programmed so that when it receives a message containing an addressee identification number (ID_addressee) differing from its own identification number (ID_i), from said channel via its own transmission and reception device (12), it transmits at least an echo of the message received on said channel (3) after a given delay interval, unless it receives on said channel a reply to said message, a routine being provided to prevent unlimited generations of echoes of a given message.

65. Control device as claimed in claim 64, programmed to temporarily store identifying information of each message of which it generates an echo and not to generate subsequent echoes of said message while the identifying information remains stored.

66. Control device as claimed in claim 65, programmed to store the identifying information of messages of which it generated an echo in a temporary list of identifying information relative to a maximum number of said messages.

67. Control device as claimed in one or more of said claims from 64 to 66, wherein each of said messages contains a counter (TTL).

68. Control device as claimed in claim 67, wherein each control device is programmed so that when it receives a message containing an addressee identification number (ID_addressee) differing from its own addressee number

(ID_i) it transmits an echo of the message received on said channel (3), decreasing said counter (TTL) by a predetermined value.

69. Control device as claimed in one or more of the claims from 64 to 60, programmed to receive broadcast messages addressed to a generic device, and to transmit on said channel echoes of said broadcast messages, said broadcast messages containing a counter (TTL) and said control device being programmed to generate an echo of the broadcast message only if the counter does not contain a number below a minimum pre-established value.

70. Control device as claimed in at least claim 67 or 68, programmed so that before transmitting the echo of said message on said channel (3), it checks the value contained in said counter (TTL) and transmits the echo of the message on said channel only if the value of the counter of the message received is above a minimum pre-established value.

71. Control device as claimed in one or more of the claims from 64 to 70, programmed to transmit said echo of the message received with a specific delay (D).

72. Control device as claimed in claim 71, wherein said delay is determined as a function of its own identification number (ID_i).

73. Control device as claimed in claim 72, wherein said delay (□T) is equal to the duration of the message (Tm) multiplied by the identification number (ID_i) of the control device.

74. Control device as claimed in one or more of the claims from 64 to 73, programmed so that when it receives a message containing its own identification number (ID_i) as addressee identification number (ID_addressee), it transmits a reply message on said channel, in which:

- the progressive number (Pr_N) is the same as the progressive number of the message received increased by a predetermined value;
- and the portion of informative content and/or command contains a reply to the message received.

75. Control device as claimed in claim 74, wherein in said reply:

- the sender identification number (ID_sender) corresponds to the addressee identification number (ID_addressee) of the message received;
- the addressee identification number (ID_addressee) corresponds to the sender identification number (ID_sender) of the message received;

76. Control device as claimed in claim 74 or 75, wherein said progressive number in the reply message is the same as the progressive number of the message received increased by one unit.

79. Control device as claimed in on one or more of the claims from 74 to 76, programmed so that when it has received a first message containing an addressee identification number (ID_addressee) differing from its own identification number (ID_i), it stops transmitting the echo of said message when it receives a reply message to said first message from said channel.

78. Control device as claimed in claims 74 and 77, programmed so that the transmission of an echo of a first message is inhibited when said control device receives a second message containing a progressive number (Pr_N) the same as the progressive number of the first message increased by one unit.

79. Control device as claimed in on one or more of the claims from 64 to 78, programmed to perform an initial accrediting phase by a collecting unit (5) connected to said channel, during which said collecting unit assigns a specific identification number (ID_i) to each control device (7i).

80. Control device as claimed in claim 79, programmed: to transmit with a delay (□T), on request from a command received from said channel, a reply to an accrediting request, the reply containing a serial number (Ser_N) univocally correlated to said control device; and to receive and store an identification number (ID_i) from a collecting unit connected to said channel, the control device ceasing to

reply to any subsequent accrediting requests coming from said channel after having received said identification number.

81. Control device as claimed in claim 80, programmed so that during said accrediting phase, in reply to an accrediting request, it generates a random number (N_RND) and transmits said reply with a delay that is a function of said random number.

82. Control device as claimed in claim 81, wherein said delay is equal to the temporal duration of the message containing the request, multiplied by said random number.

83. Control device as claimed in claim 80, 81 or 82, wherein said replies contain:

- a progressive number (Pr_N);
- a field with a command to request a reply (M4).

84. Control device as claimed in one or more of the claims from 64 to 83, wherein said transmission and reception device (12) comprises a modem for transmission via power line carrier transmission on a power supply line (3) forming said communication channel.